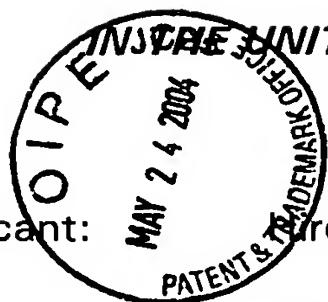


JP 1/8



UNITED STATES PATENT AND TRADEMARK OFFICE

Attorney Docket No. 067123/0195

Applicant: Hirokazu HONDA

Title: METHOD OF MANUFACTURING A FLIP-CHIP
SEMICONDUCTOR DEVICE WITH A STRESS-ABSORBING
LAYER MADE OF THERMOSETTING RESIN

Application No.: 10/686,568

Filing Date: October 17, 2003

Examiner: Owens, Beth E.

Art Unit: 2824

Allowed: March 16, 2004

**INFORMATION DISCLOSURE STATEMENT
UNDER 37 CFR §1.56 and 37 CFR §1.97**

Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Sir:

Submitted herewith on Form PTO SB/08 is a list of documents known to Applicant in order to comply with Applicant's duty of disclosure pursuant to 37 CFR 1.56. A copy of each listed document is being submitted to comply with the provisions of 37 CFR 1.97 and 1.98.

The submission of any documents herewith, which is not a statutory bar, is not intended as an admission that such document constitutes prior art against the claims of the present application or that such document is considered material to patentability as defined in 37 CFR §1.56(b). Applicant does not waive any rights to take any action which would be appropriate to antedate or otherwise remove as a competent reference any document which is determined to be a prima facie prior art reference against the claims of the present application.

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TIMING OF THE DISCLOSURE

The instant Information Disclosure Statement is being filed after the mailing date of the notice of allowance under 37 C.F.R. §1.113, but before the payment of the issue fee. Accordingly, pursuant to 37 C.F.R. §1.97(d), a certification and fee are required.

CERTIFICATION

The undersigned hereby certifies in accordance with 37 C.F.R. §1.97(e)(1) that item of information A2 listed on the Form PTO SB/08 submitted with this Information Disclosure Statement was first cited in a communication from a foreign patent office in a counterpart foreign application not more than three (3) months prior to the filing of this Statement. Item of information A1 is a published U.S. patent application that is a counterpart to item of information A2.

FEE

A fee in the amount as set forth in 37 C.F.R. §1.17(p) is attached.

RELEVANCE OF EACH DOCUMENT

A translation of a portion of a Chinese Office Action that issued April 23, 2004 with respect to a counterpart Chinese patent application is provided below:

"This invention relates to a flip-chip type semiconductor device with stress-absorbing layer made of thermosetting resin and its manufacturing method.

The Examiner is of the opinions as follows:

1. Claim 1 is rejected according to Article 22(3) of the Chinese Patent Law.

Claim 1 claims a flip-chip type semiconductor device. Reference 1 (CN1 210621 A) (corresponding to Japanese Patent Application: PCT/JP97/04437) discloses a semiconductor device (see line 18, page 8 to line 24, page 22, and Fig. 1 - 23); in particular, the following technical features are disclosed: a

semiconductor substrate; a plurality of electrodes formed on said semiconductor substrate; an insulating stress-absorbing resin layer made of resin, formed on said semiconductor substrate and having openings corresponding to said electrodes; a plurality of wirings filled in said openings; and a plurality of metal bumps formed on a flexible conductive layer.

As it could be seen, Reference 1 has already disclosed a majority of the technical features of Claim 1, and the difference between the technical solution of Claim 1 and those disclosed by Reference 1 is in that: 1) said insulating stress-absorbing resin layer is made of thermosetting resin; and 2) said openings are filled with flexible conductive members.

However, in Reference 1, it disclosed that the resins used as the insulating stress-absorbing resin layer are the resins whose Young's moduli are lower than 1×10^{10} Pa, and the thermosetting resins belong to the resins whose moduli are lower than 1×10^{10} Pa. Therefore, it's apparent to those skilled in the art to use a thermosetting resin to make the insulating stress-absorbing resin layer. Furthermore, Reference 3 (US5683942A) discloses a semiconductor device, wherein an insulating stress-absorbing resin layer is made of a thermosetting resin. The above differential technical feature 2) has already been disclosed in Reference 2 (IEMT/[MC Proceedings "Advanced MCM-Ls for Consumer Electronics", Amami, et al, pp. 249 — 254, 1998) (full text). In Reference 2, it is disclosed that a pad electrode and an external electrode are connected with a flexible conductive member. For those skilled in the art, it is apparent to obtain the technical solution of Claim 1 based on the combination of Reference 1 and Reference 2. Consequently, the technical solution for which protections are sought in Claim 1 is lack of inventiveness specified in Article 22(3) of the Chinese Patent Law.

Article 22(3) of the Chinese Patent Law: Inventiveness means that, as compared with the technology existing before the date of filing the invention has prominent substantive features and represents a notable progress and that the utility model has substantive features and represents progress.

2. The additional technical feature of Dependent Claim 2 is that: said thermosetting resin is one of epoxy resin, silicone resin, polyimide resin, polyolefin resin, cyanate-ester resin, phenol resin, naphthalene resin and fluorene resin. But, these resins are all the common-used resin of the art. Therefore, the technical solution for which protections are sought in Claim 2 does not comply with the requirements of inventiveness of Article 22(3) of the Chinese Patent Law.

3. The additional technical feature of Dependent Claim 3 is that: said flexible conductive members are made of powdered material including at least one of Cu, Pb, Sn, Ni, Pd, Ag and Au. But, in Reference 2, it is disclosed that the flexible conductive member is made of Ag. Therefore, the technical solution for which protections are sought in Claim 3 does not comply with the requirements of inventiveness of Article 22(3) of the Chinese Patent Law.
4. The additional technical feature of Dependent Claim 4 is that: further comprising a plurality of conductive wires each included in one of said flexible conductive members. But, it is the well-know knowledge in the art. Therefore, the technical solution for which protections are sought in Claim 4 does not comply with the requirements of inventiveness of Article 22(3) of the Chinese Patent Law.
5. The additional technical feature of Dependent Claim 5 is that: further comprising a plurality of conductive members formed between said insulating stress-absorbing resin layer and one of said metal bumps, each of said conductive members being electrically connected to one of said flexible conductive members. But, it has already been disclosed in Reference 1. Therefore, the technical solution for which protections are sought in Claim 5 does not comply with the requirements of inventiveness of Article 22(3) of the Chinese Patent Law.
6. The additional technical feature of Dependent Claim 6 is that: further comprising a plurality of conductive members formed between said insulating stress-absorbing resin layer and one of said metal bumps, each of said conductive members comprising a bonding wire, But, it has already been disclosed in Reference 1. Therefore, the technical solution for which protections are sought in Claim 6 does not comply with the requirements of inventiveness of Article 22(3) of the Chinese Patent Law.
7. The additional technical feature of Dependent Claim 7 is that: further comprising a plurality of conductive members formed between said insulating stress-absorbing resin layer and one of said metal bumps, each of said flexible conductive members comprising an electroless plating layer. But, it is the well-know knowledge in the art. Therefore, the technical solution for which protections are sought in Claim 7 does not comply with the requirements of inventiveness of Article 22(3) of the Chinese Patent Law.

8. The additional technical feature of Dependent Claim 8 is that: said insulating stress-absorbing resin layer is photosensitive. But, it has already been disclosed in Reference 1. Therefore, the technical solution for which protections are sought in Claim 8 does not comply with the requirements of inventiveness of Article 22(3) of the Chinese Patent Law.
9. The additional technical feature of Dependent Claim 9 is that: further comprising a photosensitive insulating stress-absorbing resin layer between said insulating stress-absorbing resin layer and said conductive members. But, it is the well-know knowledge in the art. Therefore, the technical solution for which protections are sought in Claim 9 does not comply with the requirements of inventiveness of Article 22(3) of the Chinese Patent Law.
10. Claim 12 is rejected according to Article 22(3) of the Chinese Patent Law.

Claim 12 claims a method for manufacturing a flip-chip type semiconductor device. Reference 1 (CN1210621A) discloses a method for manufacturing a semiconductor device (see line 18, page 8 to line 24, page 22, and Fig. 1 — 23); in particularly, the following technical features are disclosed: forming a plurality of electrodes on a semiconductor device; forming an insulating stress-absorbing resin layer made of resin on said semiconductor substrate, said insulating stress-absorbing resin layer having openings corresponding to said electrodes; forming a plurality of wirings filled in said openings; and forming a plurality of metal bumps on a flexible conductive layer.

As it could be seen, Reference 1 has already disclosed a majority of the technical features of Claim 12, and the difference between the technical solution of Claim 1 and those disclosed by Reference 1 is in that: 1) said insulating stress-absorbing resin layer is made of thermosetting resin; and 2) said openings are filled with flexible conductive members.

However, in Reference 1, it disclosed that the resins used as the insulating stress-absorbing resin layer are the resins whose Young's moduli are lower than 1×10^9 Pa, and the thermosetting resins belong to the resins whose moduli are lower than $1 < 100$ Pa. Therefore, it's apparent to those skilled in the art to use a thermosetting resin to make the insulating stress-absorbing resin layer. Furthermore, Reference 3 (US5683942A) (see line 49, column 4 to line 38, column 8, and Fig. 5) discloses a semiconductor device, wherein an insulating stress-absorbing resin layer is made of a thermosetting resin. The above differential

technical feature 2) has already been disclosed in Reference 2 (IEMT/IMC Proceedings "Advanced MCM-Ls for Consumer Electronics", Amami, et al, pp. 249—254, 1998) (full text). In Reference 2, it is disclosed that a pad electrode and an external electrode are connected with a flexible conductive member. For those skilled in the art, it is apparent to obtain the technical solution of Claim 12 based on the combination of Reference 1 and Reference 2. Consequently, the technical solution for which protections are sought in Claim 12 is lack of inventiveness specified in Article 22(3) of the Chinese Patent Law.

11. The additional technical feature of Dependent Claim 13 is that: said thermosetting resin is one of epoxy resin, silicone resin, polyimide resin, polyolefin resin, cyanate-ester resin, phenol resin, naphthalene resin and fluorene resin. But, these resins are all the common-used resin of the art. Therefore, the technical solution for which protections are sought in Claim 13 does not comply with the requirements of inventiveness of Article 22(3) of the Chinese Patent Law.
12. The additional technical feature of Dependent Claim 14 is that: said insulating stress-absorbing resin layer forming step comprises the steps of: coating an insulating stress-absorbing resin layer by a spin-coating process; and patterning said insulating stress-absorbing resin layer by a photolithography and wet etching process. But, it has already been disclosed in Reference 1. Therefore, the technical solution for which protections are sought in Claim 14 does not comply with the requirements of inventiveness of Article 22(3) of the Chinese Patent Law.
13. The additional technical feature of Dependent Claim 15 is that: said flexible conductive members are made of powdered material including at least one of Cu, Pb, Sn, Ni, Pd, Ag and Au. But, in Reference 1, it is disclosed that the wiring material is made of Cu or Au. Therefore, the technical solution for which protections are sought in Claim 15 does not comply with the requirements of inventiveness of Article 22(3) of the Chinese Patent Law.
14. The additional technical feature of Dependent Claim 16 is that: further comprising a step of forming a plurality of conductive wires each included in one of said flexible conductive members. But, it is the well-know knowledge in the art. Therefore, the technical solution for which protections are sought in Claim 16 does not comply with the requirements of inventiveness of Article 22(3) of the Chinese Patent Law.

15. The additional technical feature of Dependent Claim 17 is that: further comprising a step of forming a plurality of conductive members formed between said insulating stress-absorbing resin layer and one of said metal bumps, each of said conductive members being electrically connected to one of said flexible conductive members. But, it has already been disclosed in Reference 1. Therefore, the technical solution for which protections are sought in Claim 17 does not comply with the requirements of inventiveness of Article 22(3) of the Chinese Patent Law.
16. The additional technical feature of Dependent Claim 18 is that: further comprising a step of forming a plurality of conductive members formed between said insulating stress-absorbing resin layer and one of said metal bumps, each of said conductive members comprising a bonding wire. But, it has already been disclosed in Reference 1. Therefore, the technical solution for which protections are sought in Claim 18 does not comply with the requirements of inventiveness of Article 22(3) of the Chinese Patent Law.
17. The additional technical feature of Dependent Claim 19 is that: further comprising a step of forming a plurality of conductive members formed between said insulating stress-absorbing resin layer and one of said metal bumps, each of said flexible conductive members comprising an electroless plating layer. But, it is the well-know knowledge in the art. Therefore, the technical solution for which protections are sought in Claim 19 does not comply with the requirements of inventiveness of Article 22(3) of the Chinese Patent Law.
18. The additional technical feature of Dependent Claim 20 is that: said insulating stress-absorbing resin layer is photosensitive. But, it has already been disclosed in Reference 1. Therefore, the technical solution for which protections are sought in Claim 20 does not comply with the requirements of inventiveness of Article 22(3) of the Chinese Patent Law.
19. The additional technical feature of Dependent Claim 21 is that: further comprising a step of forming a photosensitive insulating stress-absorbing resin layer between said insulating stress-absorbing resin layer and said conductive members. But, it is the well-know knowledge in the art. Therefore, the technical solution for which protections are sought in Claim 21 does not comply with the requirements of inventiveness of Article 22(3) of the Chinese Patent Law.

20. The reference numbers 11, 13, 16, 21, 36, 38, 51, 61, 31, 35, 37, 34', 34a, 34'b, 72a, and 72 in the Claims are not coherent with those in the Description, which makes the Claims unclear and not comply with the requirements of Rule 20(1) of the Implementing Regulations of the Chinese Patent Law. It is advised to delete all the reference numbers in the Claims.

Rule 20(1) of the Implementing Regulations of the Chinese Patent Law: The claims shall define clearly and concisely the matter for which protection is sought in terms of the technical features of the invention or utility model.

21. In Claims 1,3,4,5,6,7, 12, 15, 16, 17, 18, 19, 24, 25, 26, 27, 32, 33, 34, 35, 41, 42, 43, and 44, the expression of "flexible conductive member" are not coherent with the expression of "flexible conductive layer" in the Description, and thus, it could not be supported by the description, and does not comply with the requirements of Article 26(4) of the Chinese Patent Law."

Applicant's statements regarding the Chinese Office Action is based on a partial translation that Applicant's representative obtained. This statement should in no way be considered as an agreement by Applicant with, or an admission of, what is asserted in the Chinese Office Action.

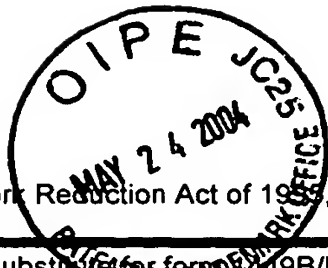
Applicant respectfully request that the listed documents be considered by the Examiner and formally be made of record in the present application and that an initialed copy of Form-SB08 be returned in accordance with MPEP §609.

Respectfully submitted,

May 24, 2004
Date

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Substituted for PTO 49B/PTO		Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT Date Submitted: May 24, 2003 (use as many sheets as necessary)		Application Number	10/686,568
		Filing Date	10/17/2003
		First Named Inventor	Hirokazu HONDA
		Group Art Unit	2824
		Examiner Name	B. E. Owens
Sheet 1 of 1	Attorney Docket Number	067123-0195	

U.S. PATENT DOCUMENTS						
Examiner Initials*	Cite No. ¹	U.S. Patent Document		Name of Patentee or Applicant of Cited Document	Date of Publication of Cited Document MM-DD-YYYY	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number	Kind Code ² (if known)			
	A1	5,683,942		KATA et al.	11/04/1997	

FOREIGN PATENT DOCUMENTS								
Examiner Initials*	Cite No. ¹	Foreign Patent Document			Name of Patentee or Applicant of Cited Documents	Date of Publication of Cited Document MM-DD-YYYY	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T ⁶
		Office ³	Number ⁴	Kind Code ⁵ (if known)				
	A2	CN	1210621			03/10/1999		ABS

NON PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No. ¹	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.) date, page(s), volume-issue number(s), publisher, city and/or country where published.	T ⁶
	A3	KAZUYOSHI AMAMI et al., "Advanced MCM-Ls for Consumer Electronics", 1998, pages 249-254.	

Examiner Signature	Date Considered
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*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ Unique citation designation number. ² See attached Kinds of U.S. Patent Documents. ³ Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). ⁴ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document.

⁵ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. ⁶ Applicant is to place a check mark here if English language Translation is attached.

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